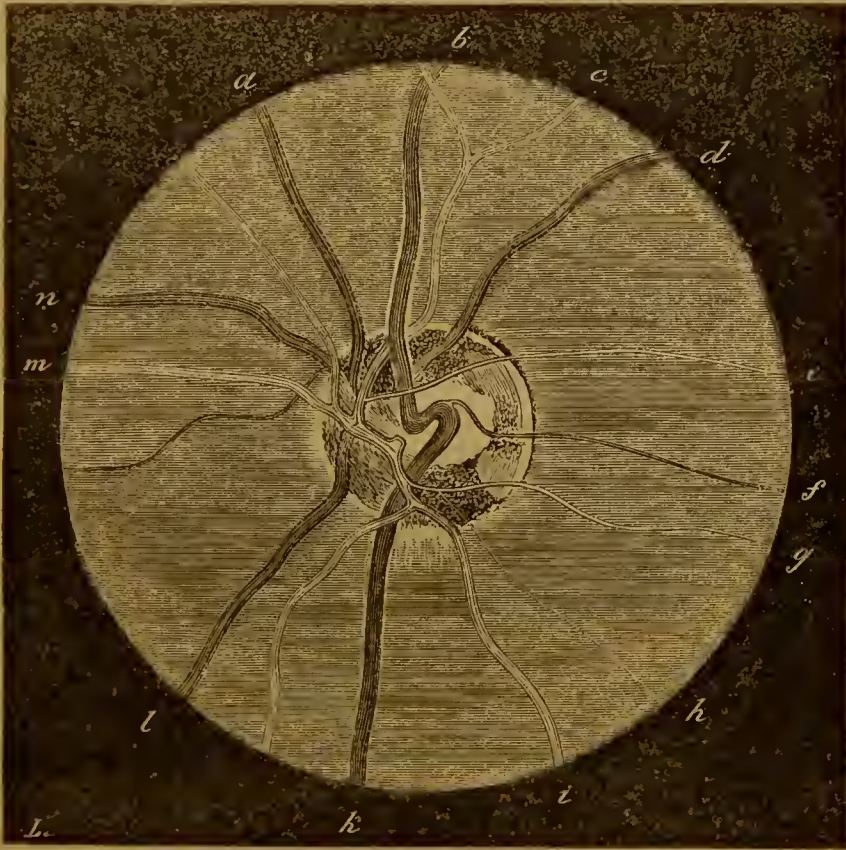






point of exit of the vessels is a natural phenomenon. The retinal vessels are of nearly normal dimensions; the arteries are perhaps rather attenuated. (The tenuity of the retinal vessels has no direct relation whatever with the atrophy of the papilla, but varies considerably, according to its cause.) Besides, the finest twigs present nearly their normal diameter, as may be seen at *e, f, g* in the following figure; and some of the



very fine branches which reach the *macula lutea* may be followed up to the *foramen centrale*. On the other hand, in certain isolated vessels (especially *g* and *k*) the characteristic sign of atrophy of the retina and optic nerve may be recognized by the presence of those narrow white lines along the sides of the vessels, which are derived from hypertrophy of the adjacent cellular tissue. The pigmentation is at the same time different in the two eyes. The figure exhibits the erect image of the left fundus oculi. The pigment there extends to the left, above and to the left, below to the centre into the brightly-reflecting tissue, which has there taken the

place of the nerve substance. A uniform coloration is present, at the most slightly streaky, of a slaty, nearly black grey, darker above. The vessels which enter this tissue are thus concealed from view, such as the veins *a* and *k*. The pigment may be observed passing between the artery *i*, which is superficial and quite free, and the vein *k*, which lies further back. To the right of the centre, that is in the outer half of the papilla, the pigment is still more superficially disposed in groups of points, of a deep black, very minute and easily defined. They extend inwards up to the limits of the physiological excavation, and only reach directly downwards the outer border of the papilla. These minute, very fine points correspond probably to separate cells, which would then average in size those of the choroidal epithelium, but would contain a much darker pigment, as may be inferred by comparing the intensity of the black coloration with their relatively small size. They would thus correspond nearly in size to the cells which are developed in retinitis pigmentosa.

In the papilla of the right eye the coloration is of slight extent. It is limited to a triangular patch of about a quarter the size of the papilla, one of the angles of which extends a little beyond the border of the nerve; this does not occur in the left eye.

One question at first presents itself for determination, namely, whether this pigmentation is of a pathological nature, or whether, considering it to have preceded the atrophy of the optic nerve, it is to be regarded as a congenital anatomical peculiarity. This being the only case hitherto described of such a peculiarity, no conclusion on this point can naturally be drawn from any varieties in the form and grouping of the pigment. But, on the other hand, it is very important to take into account the general state of the eye as regards its pigmentation. In the physiological case spoken of, the pigmentation of the optic nerve was accompanied by an extreme pigmentation of nearly the entire eye, at any rate of the iris, choroid, and sclerotic. The iris was of so deep a brown, nearly black, that the edge of the pupil could only be determined by looking quite closely at it. Around the cornea, a little way from its margin, the sclerotic was studded with dark grey,



somewhat violet, spots ; the choroid had so dark a colour, that if the fundus was simply lighted up by the ophthalmoscope, the pupil was hardly illuminated, especially if the *macula lutea*, which appeared nearly black, was looked at.

But in the case we are now discussing, the pigmentation of the fundus oculi was very moderate in comparison with that of the person (black hair and blue eyes). The epithelial cells have generally about the amount of pigmentation which I have delineated in figs. 4 and 5, pl. II. of my Atlas, where the pigment is a little way from the cell-walls, and disposed around the nucleus ; so that the isolated points which confer on the fundus oculi its peculiar grain, may thus be more easily recognized by means of the ophthalmoscope. Towards the posterior pole, especially in the region of the *macula lutea* itself, they are a little darker ; on the other hand, towards the periphery of the fundus oculi, especially near the equator, the coloration is a little less, and everywhere the choroidal vessels may be seen between ; in the central parts of the fundus oculi they are separated from one another by intervascular spaces of a light grey ; in the periphery they may be seen better defined, the interspaces being there clearer. Admitting that in the present case the pigmentation is a pathological phenomenon, we should the more feel induced to endeavour to trace out the development of the pigment, inasmuch as we may have to wait a long time before we have an opportunity of anatomically investigating a phenomenon of so rare occurrence.

Apart from the very rare pigmentary deposits in the retina, exudations are met with differing in form and tint :

1°. Pigment derived from the epithelial layer of the choroid which has penetrated into the retina, either as a consequence of processes in the bacillary layer or simultaneously with exudations in the choroid.

And 2°, Pigment spontaneously developed in the retina itself around its vessels.

In the first of these two forms, even in the quite chronic form, traces of the morbid state of the choroid may, by aid of the ophthalmoscope, always be recognized, especially in irregularities in the epithelium, either in the immediate neighbourhood of the black patches, or more extensively in the eye. And yet no

such irregularities are met with in the case under examination: the choroid terminates, as normally, at the edge of the optic disk by a well-defined, deeply-pigmented border, and does not present the slightest deficiency or irregularity in the epithelial cells. The diminution of pigment toward the periphery which we have mentioned above is very slight and uniform in its character, and generally constitutes a very common physiological fact. After this we can only admit that the pigment-cells met with in the papilla were developed in the cellular tissue which in atrophy of the optic nerve replaces the nerve-fibres.



